

## **DIVISION 4 – WATER DISTRIBUTION**

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## **DIVISION 4**

# **WATER DISTRIBUTION**

## **401 GENERAL**

### **401.01 AUTHORITY AND PURPOSE**

- 401.01.A** These Design Standards shall apply to all improvements within existing and proposed public right-of-way and public easements, to all improvements to be maintained by the City, and to all improvements for which the City Code requires approval by the City. Most of the elements contained in these Design Standards are public works oriented and it is intended that they apply to both publicly financed public improvements under City contract and privately financed public improvements.
- 401.01.B** Private construction firms, Developers, consulting engineers, or any other individuals or business entities engaged in the design and construction of improvement projects that ultimately will be owned, operated, or maintained by the City shall comply in every respect with these standards. Where minimum values are stated, greater values should be used whenever practical; where maximum values are stated, lesser values should be used whenever practical.
- 401.01.C** The purpose of these Design Standards is to provide a consistent policy under which certain physical aspects of public improvements shall be implemented. All public system improvements and public works facilities shall be designed and constructed in accordance with all applicable rules and regulations of the City and any City interpretations of those rules and regulations, including applicable technical guidance manuals, and in accordance with all applicable federal, state, and local statutes and rules. Approval of public improvements must be made by the City Engineer or the Public Works Director before construction is permitted. An authorized representative of the City will be available for construction observation during construction of the project.
- 401.01.D** It is important to emphasize that these Design Standards are not intended to inappropriately restrict or constrain the originality or innovativeness of the Design Engineer and his or her ability to exercise and apply professional judgment to each situation and project. The City recognizes that every public improvement project has unique characteristics and situations. These Design Standards cannot provide for all situations and are intended to assist, but not to serve as a substitute for competent work by design professionals. It is expected that the Design Engineer will bring to each project the best of skills from the Design Engineer's respective discipline.
- 401.01.E** If the Design Engineer anticipates challenges in meeting these Design Standards, they should contact the City Engineer prior to extensive design efforts. The City Engineer will seek to work with each designer to achieve a satisfactory design and construction project that is in the best long-term interests of the City of Stayton and one that complies with all applicable rules and regulations.
- 401.01.F** These Design Standards are not intended to limit any innovative or creative effort which could result in better quality, better cost savings, or both. Any proposed departure from the Design Standards will be judged; however, on the likelihood that such variance will produce a comparable result, or long-term benefit to the City, in every way adequate for the intended purpose.



- 401.01.G** Requests for alternatives to these Design Standards will be considered for approval by the City Engineer as the need arises and conditions warrant modification. Request must show that the variance meets the intent of the Design Standards and will not compromise safety, impact other properties or cause an increase in maintenance. This consideration will be on a case-by-case basis and require sufficient justification prior to approval.
- 401.01.H** All franchise utility improvements, including telephone, electrical power, gas and cable TV shall meet the current standards of the appropriate agency as well as City Standards.
- 401.01.I** In the case of conflicts between the text of these Design Standards and the Standard Drawings, or between the provisions of these Design Standards and the Standard Construction Specifications, the more stringent as determined by the City Engineer shall apply.
- 401.01.J** All surveys for public works facilities shall be performed under the direction of a Professional Land Surveyor registered in the State of Oregon. All elevations shall be referenced to NGVD 29 vertical datum. Vertical benchmark locations shall be coordinated with the City.
- 401.01.K** On completion of projects to become public works, the Design Engineer shall submit one complete set of reproducible "Record Drawings" (As-Built), a compact disc (CD) containing electronic PDFs and cad files (AutoCAD version within 5 years of submittal, or others as approved) to the City Engineer. The drawings shall show any deviations from the original construction drawings and shall include sufficient information to accurately locate public works facilities. No bond will be released until the City Engineer receives an acceptable set of reproducible Record Drawings from the Design Engineer, with his/her stamp of certification.
- 401.01.L** For privately financed public improvements, the Design Engineer, at the completion of construction, shall submit a completion certificate to the City stating that all work has been completed in accordance with the approved project plans and specifications.
- 401.01.M** Before the City accepts a public works project for operation and maintenance, a one (1) year Warranty Bond on all materials and workmanship incorporated in the project shall be provided to the City.
- 401.01.N** The objective of these Design Standards is to develop a water distribution system that will:
- ❖ Be consistent with the adopted Water Master Plan.
  - ❖ Be of materials strong enough to resist all expected loads, both internal and external, and able to preserve the potability of the water supply.
  - ❖ Provide a water distribution system that is consistent and predictable.
  - ❖ Be economical and safe to build and maintain.

## **401.02 APPLICABILITY**

- 401.02.A** These Design Standards will govern the design of permanent water distribution facilities serving properties within the City of Stayton and applicable work within its service areas. This document will be routinely referred to as the Design Standards.

## **401.03 REFERENCES**

- 401.03.A** These Design Standards are intended to be consistent with the most current provisions of the documents and requirements listed and referenced in Subsection 101.03 and others specifically listed below. Projects are expected to be consistent with the following:



1. Applicable design criteria and concepts consistent with the most recent Water Master Plan adopted by the City of Stayton unless more restrictive criteria are identified herein. Where additional detailed information and background is required for a particular project, the Water Master Plan shall be referred and adhered to, as applicable. Any deviations from the Water Master Plan shall be flagged and presented to the City Engineer for consideration.
2. Applicable design criteria and concepts in accordance with the rules and regulations of the Oregon Department of Human Services – Drinking Water Program (DHS-DWP) as established in the Oregon Administrative Rules, Chapter 333, Division 61.
3. State of Oregon Plumbing Specialty Code.
4. Applicable design guidelines published by the American Water Works Association.
5. Applicable design guidelines published by the American Society of Civil Engineers.

#### **401.04 SPECIAL DESIGN APPLICATIONS**

**401.04.A** Special design applications not covered in these Design Standards require review and approval by the City. Additional review and approval by the Department of Humans Services – Drinking Water Program (DHS-DWP) may also be required. Submittal of full design calculations, supplemental drawings, and information will be required prior to any approval.

**401.04.B** Such design applications requiring special review and approval include, but are not limited to, the following:

- ❖ Water Distribution Pump Stations
- ❖ Reservoirs
- ❖ Relining of Existing Water Mains
- ❖ Treatment Plants
- ❖ Pressure Regulating Devices
- ❖ Flow Measurement/Monitoring/Controls/Telemetry Devices

#### **401.05 STANDARD CONSTRUCTION SPECIFICATIONS AND STANDARD DRAWINGS**

**401.05.A** Except as otherwise provided by these Design Standards, all construction design detail, workmanship, and materials shall be in accordance with the current edition of the City of Stayton Public Works Standard Construction Specifications and Standard Drawings.

#### **401.06 CITY POLICY REGARDING ENGINEERING**

**401.06.A** It will be the policy of the City to require compliance with Oregon Revised Statute 672 for Professional Engineers.

**401.06.B** Engineering plans, reports, or documents shall be prepared by a registered Professional Engineer or by a subordinate employee under the Design Engineer's direction, and shall be signed by the Design Engineer and stamped with the Design Engineer's seal to indicate responsibility for them. The Design Engineer shall review any proposed public facility extension, modification, or other change with the City prior to engineering or other proposed design work to determine if there are any special requirements or whether the proposal is permissible.



- 401.06.C** City approval of plans or any other engineering document produced by the Design Engineer does not in any way relieve the Design Engineer of responsibility to meet all applicable City, County, State, and Federal requirements, and the obligation to protect life, health, and property of the public. The plan for any project shall be revised or supplemented at any time it is determined that the project requirements have not been met.

## **401.07 CONVENTIONS USED THROUGHOUT THE DESIGN STANDARDS**

- 401.07.A** See Subsection 101.07 for conventions used throughout these Design Standards.

## **401.08 ORGANIZATION AND CLASSIFICATION OF DIVISIONS**

- 401.08.A** See Subsection 101.08 for the organization and classification of divisions throughout these Design Standards.

## **401.09 CLARIFICATIONS, MODIFICATIONS, AND REVISIONS TO DESIGN STANDARDS**

- 401.09.A** These Design Standards will be periodically updated due to changes in policy or procedures, new technology, and methods of design and construction. Periodic revisions to these Design Standards will be necessary to maintain consistency in that regard. The date appearing on the title page is the date of the latest revision for each Division. Parenthetical notations at the bottom of each page indicate the most recent change. It will be the user's responsibility to obtain and maintain his/her copy of these Design Standards with the latest changes.
- 401.09.B** See Subsection 101.09 for general policies and procedures regarding clarifications, modifications, and revisions to the Design Standards.

## **401.10 DEFINITIONS AND TERMS**

- 401.10.A** See Subsection 101.10 for standard definitions and terms used throughout these Design Standards.

# **402 GENERAL DESIGN REQUIREMENTS**

## **402.01 PERFORMANCE STANDARDS**

- 402.01.A** Water distribution systems shall be designed to meet Oregon Administrative Rules (including ORS448), AWWA Standards, and guidelines of the current Water Master Plan and its updates.
- 402.01.B** The water system shall have sufficient capacity to maintain 40 psi at the building side of the meter for one and two family dwellings. For other developments a minimum pressure of 35 psi will be provided at the building side of the meter during periods of maximum day demand. The system shall have adequate flow during expected maximum daily demand plus fire flows while maintaining a minimum 20 psi operating pressure. Normal working pressure in the distribution system should be approximately 60 psi with a range of 40 psi to 80 psi. Any isolated locations with pressure above 80 psi require a Pressure Reducing Valve (PRV) on the customer side of the meter. NOTE: A pump shall not be used on a service line to provide adequate pressure to a subdivision lot or property located above the pressure level of the supply main.



**402.01.C** Water system design shall meet distribution needs for projected maximum daily demand within a given service area. New water systems shall allow for future extensions beyond present development that are consistent with the master plan. New water systems shall be sized according to the current zoning area fire flow needs, velocity, standards, and water modeling determinations.

**402.01.D** All waterlines shall be located within the public right-of-way or as directed and approved by the City Engineer. These lines are placed in the public right-of-way for ease of maintenance and access, control of the facility, operation of the facility, and to permit required replacement and/or repair. The City Engineer, under special conditions, may allow a public waterline to be located within a public water easement as referenced in Subsection 102.08.

## **402.02 WATERLINE PLANS**

**402.02.A** Complete plans and specifications for proposed water distribution system projects, including any necessary public dedications and easements, shall be submitted to the City Engineer for review. Such plans and specifications must receive City Engineer approval prior to construction permit issuance and prior to beginning of construction. Engineering documents shall be prepared by a Professional Engineer registered and licensed in the State of Oregon.

**402.02.B** Engineering design plans drawn to scale, showing the existing and proposed water system, shall be submitted in accordance with Division 2 of these Design Standards. The proposed plan shall show profile and plan view of the proposed improvements.

## **402.03 PIPE MATERIALS AND SIZE**

**402.03.A** All public water distribution systems shall be constructed with ductile iron pipe, minimum thickness Class 52. All such pipe shall be cement mortar-lined pipe with push-on or mechanical type joints.

**402.03.B** When a potential corrosive condition is encountered, all ductile iron pipe and fittings will be polyethylene encased with an 8-mil tubing meeting manufacturer and AWWA Standards. Where an active cathodic protection system is encountered as a result of other utilities, a deviation from the normal pipe design/material/installation practice may be required by the City Engineer.

**402.03.C** Standard pipe sizes for distribution and transmission mains will be 8-inch, 12-inch, 16-inch, 20-inch, 24-inch, and 30-inch. Smaller diameter lines may be acceptable in some situations if approved by the City Engineer. For example, a 6-inch line may be approved for dead-end streets that will serve not more than twelve (12) residents and a fire hydrant is not required on the line being installed. Designs requiring pipe sizes larger than 30-inch will be reviewed on a case-by-case basis.



**402.03.D** The pipe material, size, and typical applications are as shown in the following Table:

<b>MINIMUM PIPE SIZE</b>	<b>CRITERIA</b>
1-inch and 2-inch Copper	For services only. 1-inch is minimum size for domestic services and is used for 3/4-inch x 1-inch and 1-inch meters. 2-inch services are minimum size for 1.5-inch and 2-inch meters.
4-inch and 6-inch Ductile Iron	Dead-end streets; No contemplated extension of the water main; Serving 12 or less residential properties; Maximum distance of 450-feet or less for looped or 200-feet or less for dead-ends; No requirement for fire hydrants
6-inch Ductile Iron	Fire hydrant laterals served by minimum 8-inch distribution lines.
8-inch Ductile Iron	Residential zoning distribution water mains for a grid (looped) system, not to exceed an unsupported length of 600-feet and will not be permanently dead-ended. Looping of the distribution grid will be at least every 600-feet.
12-inch Ductile Iron	Commercial, multi-family, and industrial zoning.
16-inch Ductile Iron and larger	As required for specific development demands or transmission mains.

**402.03.E** Where system static pressures allow and field flow measurement or system modeling shows adequacy, velocities in distribution mains may be designed but shall not exceed 8-feet per second for combined fire, domestic, and irrigation flows. Velocity in service lines shall be designed not to exceed 10-feet per second.

**402.03.F** For portions of the water system with mid-range to low-static pressures, required flows may not be achievable while still maintaining a minimum system residual of 20 psi. Oversizing of waterlines may be required to achieve the required flows.

## **402.04 WATER SYSTEM CLASSIFICATION**

**402.04.A** DISTRIBUTION MAINS (12-INCHES AND SMALLER). Mains that are used for servicing consumers.

**402.04.B** TRANSMISSION MAINS (16-INCHES AND LARGER). Mains used for transporting water from the source of supply and storage reservoirs to the distribution system and distribution reservoirs. Some transmission lines serve a dual purpose as distribution lines also to avoid the need for multiple lines in one location.

## **402.05 WATER SYSTEM CAPACITY**

**402.05.A** Design capacities shall meet requirements of the current Water Master Plan and its system model and shall be determined by consideration of the following factors and assumptions:

- ❖ Area to be served, both immediate and adjacent
- ❖ Current and projected population within the areas to be served
- ❖ Current and projected land use within the areas to be served
- ❖ Commercial, industrial, or institutional users to be served
- ❖ Changes in any of the above factors that are likely to occur within a foreseeable time period





**402.05.B** Head loss shall be determined by the Hazen-Williams equation.

$$h_L = \frac{4.726 * Q^{1.852} * L}{C^{1.852} * d^{4.87}}$$

Where:

$h_L$  = head loss for pipe length L in feet  
Q = Flow in cubic feet per second  
C = Hazen-Williams roughness coefficient  
d = Inside diameter of pipe in feet  
L = Length of pipe in feet

**402.05.C** The Table below provides the "C" values that are to be used on various pipe diameters for in-service mains.

Pipe Diameter	C Value
8 Inches and Less	100
10 to 12 Inches	110
Greater than 12 inches	120

**402.05.D** Velocities and head loss shall meet the requirements outlined in the following Table.

LINE TYPE	MAX. VELOCITY (FT./SEC)	MAX. HEAD LOSS (FT./1000 FT.)
Distribution	8	10
Transmission	5	3

**402.05.E** A 20 psi residual pressure under fire flow conditions shall be maintained in the distribution system.

**402.05.F** In the absence of consumption data or other reliable information, the following factors are assumptions that shall be used to calculate demands:

PEAK HOUR DEMANDS	
RESIDENTIAL DEVELOPMENT	
Single Family Residence	0.75 gpm
Residential	0.25 gpm per person
COMMERCIAL DEVELOPMENT	
Light	4,500 gal/ac/day
General	7,500 gal/ac/day
Central Business District	6,250 gal/ac/day
INDUSTRIAL DEVELOPMENT	
Park	3,000 gal/ac/day
Light	3,250 gal/ac/day
Heavy	6,300 gal/ac/day



**402.05.G** Demand for unique commercial installations, industrial users, master planned developments, multiple, and institutional facilities will be reviewed by the City Engineer on an individual basis.

**402.05.H FIRE FLOWS**

1. The minimum fire flow in single-family residential areas shall be 1,000 GPM at 20 psi residual pressure, except in areas where homes exceed 3,600-square feet or areas of mixed use, in which case the fire flow will be as determined by the Fire Code and the Fire Marshall.
2. Fire flow for commercial and industrial areas shall be as required by the Fire Code and the Fire Marshall.
3. The recommended minimum fire flows, at 20 psi residual pressure, shall be as shown in the following Table, unless a more stringent minimum fire flow is required by the Fire Marshall and/or Fire Code.

LAND USE	RECOMMENDED MINIMUM FIRE FLOWS (GPM)	RECOMMENDED DURATION (HR.)
Industrial	5,000	4
Downtown	3,500	3
Commercial	2,500	2
Multiple Family	3,500	3
Single Family	1,000	2
Mixed Use	3,500	3
Schools	5,000	4
Institutional	3,500	3

## **403 MINIMUM DESIGN CRITERIA**

### **403.01 GENERAL**

- 403.01.A** Water distribution systems shall be designed to accommodate maximum development of the service area with recognition of possible urban renewal, industrial expansion, etc. Systems shall be designed to provide for future extension with minimal disruption of existing service.
- 403.01.B** As a condition of water service, developments will be required to provide public water mains of sufficient size for consumption and fire protection to adjacent parcels. This will include the extension of water mains in easements across the property to adjoining properties and across the street frontages of the property to adjoining properties when the main is located in the street right-of-way. Property with multiple frontages will be required to extend water along all frontages. Service lines or laterals, as required, shall be extended to vacant lots if street overlays or reconstruction is contemplated.



## **403.02 THRUST RESTRAINT**

- 403.02.A** In applications requiring thrust restraint, new water mains shall be constructed of ductile iron with an internal, push-on joint restraint system. In addition, any unrestrained joints shall be properly restrained to adequately distribute anticipated thrust loading in accordance with the Standard Drawings. New water mains shall not be restrained externally with concrete reaction blocking without specific approval of the City Engineer (see Standard Construction Specifications).
- 403.02.B** Calculations for determining restrained lengths of pipe to protect specified bends and other assemblies shall be based on the following general parameters:
1. Minimum 2:1 safety margin.
  2. Minimum 150 psi test pressure.
  3. 3-feet of cover.
  4. Marginal trench and backfill conditions.

## **403.03 WATER MAIN CONFIGURATION**

- 403.03.A** The distribution system mains shall be looped at all possible locations. Developments will be required to extend mains across existing or proposed streets for future extensions of other developments. Terminations shall be planned and located such that new or existing pavement will not have to be cut in the future when the main is extended.
- 403.03.B** Tie-ins to existing, non-standard water mains (as to size and material) shall be configured for future extension with minimal impact on local water service (see Standard Construction Specifications). Tie-ins to existing water mains not contemplated for replacement shall be made with 22.5 degree or 45 degree bends. 90 degree bends shall not be used, unless otherwise approved by the City Engineer.

## **403.04 DEAD-END MAINS**

- 403.04.A** Dead-end mains that are permanent or that will be extended in the future shall be provided with a properly sized blow-off, as shown in the Standard Drawings, and located in areas approved by the City Engineer.
- 403.04.B** The installation of permanent or long-term water mains will not be permitted for dead-end mains greater than 250-feet upon which fire protection depends, or for single mains serving relatively large areas, unless otherwise approved by the City Engineer.
- 403.04.C** No more than twenty (20) single-family residences shall be temporarily served from an un-looped waterline during a phased construction, unless approved by the City Engineer.

## **404 ALIGNMENT AND COVER**

### **404.01 RIGHT-OF-WAY LOCATION**

- 404.01.A** Where waterlines are located within narrow rights-of-way (less than 50-feet), location of waterline will be reviewed by the City Engineer on a case-by-case basis.



**404.01.B** In general, water systems shall be located south or west from the right-of-way centerline or as approved by the City Engineer. Except as provided in Subsection 404.06, all waterlines shall be in the public right-of-way.

**404.01.C** Curved alignment for waterlines or mains is permitted and shall be parallel to the street centerline when practical. The minimum allowed radius will be based on allowable pipe deflection for the pipe diameter and the pipe laying length. All abrupt changes in vertical or horizontal alignment shall be made with a fitting and adequate thrust restraint. In all cases, when push-on or mechanical joint pipe is to be laid on a curve or abrupt angle either in the horizontal or vertical plane, the amount of deflection shall not exceed the maximum limits recommended by the pipe and fitting manufacturer or by the restrained retainer gland manufacturer, whichever is less.

## **404.02 MINIMUM COVER**

**404.02.A** The standard minimum cover over buried water mains within the right-of-way shall be 36-inches from finish grade. The minimum cover for water mains in areas without a hard surfacing shall be 48-inches from finish grade, unless approved otherwise by the City Engineer. Finish grade will normally mean the existing or proposed pavement elevation. Where the main is located in the cut or fill side slope or where mains are located in easements, finish grade will mean final ground elevation at the water main alignment.

**404.02.B** The standard typical trench section shall be utilized for all waterline construction. Refer to the Standard Drawings.

**404.02.C** Deviation from the above standards will be considered on a case-by-case basis by the City Engineer when the following exists:

1. When there is underlying rock strata that prohibits placement of the water main 36-inches below finish grade. In this situation, a written request must be submitted to the City Engineer that includes a soils report with a plan and profile certifying that bedrock exists less than 3-feet below the undisturbed ground surface.
2. Substantial utilities exist at an elevation that will conflict with the waterline at 36-inches below finished grade; and installation of the waterline below such utility would cause the new waterline to be at an unreasonably deep elevation below finished grade.
3. Where the water main or service must be installed at a depth less than 30-inches below finished grade.

## **404.03 SEPARATION WITH SEWER LINES**

**404.03.A** Water mains and services shall be installed a minimum clear distance of 10-feet horizontally from gravity sanitary sewer mains and laterals, and shall be installed to go over the top of such sewers with a minimum of 18-inches of clearance at intersections of these pipes (in accordance with the requirements of OAR Chapter 333, Public Water Systems). Separation from sanitary sewer force mains will be reviewed on a case-by-case basis. Exceptions will require the approval of the City Engineer. In all instances, the distances shall be measured edge to edge.



#### **404.04 SEPARATION WITH UTILITIES**

- 404.04.A** Unless otherwise approved by City Engineer, the minimum spacing between water mains and storm drains, gas lines, and other underground utilities (except sanitary sewers), shall be 5-feet horizontally when the standard utility location cannot be maintained. This separation also applies to water service and utility service lines.
- 404.04.B** Where water mains are being designed for installation parallel with other water mains, utility pipe, or conduit lines, the vertical separation shall be 12-inches below or in such a manner that will permit future side connections of mains, hydrants, or services, and avoid conflicts with parallel utilities without abrupt changes in vertical grade of the above mentioned main, hydrant, or service. Where crossing of utilities are required, the minimum vertical clearance shall be 6-inches.
- 404.04.C** Water mains shall not be installed in alleys, unless otherwise approved by the City Engineer. Wherever possible, mains will be installed on a particular street at a constant distance from the curb. On curved streets, mains may be laid on a curve concentric with the street centerline with deflections no greater than the manufacturer's specifications, or mains may be laid in straight lines along the tangent between selected angle points to avoid conflicts with other utilities. The angle point and tangent section shall not be less than 3-feet in front of the curb face.

#### **404.05 EASEMENTS**

- 404.05.A** Easements shall meet the requirements of Subsection 102.08, except as noted below.
- 404.05.B** Any water main placed within a water main easement shall be permanently marked with blue plastic marker signs at all angle points, and no less than every 200-feet. In addition, marker signs shall be placed where the waterline intersects the public right-of-way at the easement location. A monument cap set in the pavement of parking lots, driveways, etc. will be an acceptable alternative to the sign.

#### **404.06 RELATION TO WATERCOURSES**

- 404.06.A** Surface water crossings of mains shall be in accordance with Oregon Administrative Rule (OAR) 333 and the following:
1. New water mains may cross under existing streams, rivers, or other bodies of water.
  2. Mains crossing stream or drainage channels shall be designed to cross as nearly perpendicular to the channel as possible.
  3. Valves and service connections shall be provided at both ends of the water crossing so that the section can be isolated for testing or repair. The valves shall be easily accessible and not subject to flooding.
  4. ABOVE WATER CROSSINGS – The pipe shall be designed by the Design Engineer to provide support, anchorage, and protection from freezing and damage, yet shall remain accessible for repair and maintenance. All above water crossings will require review and approval by the City Engineer.



## **5. UNDERWATER CROSSINGS**

- a. The following surface water crossings will be treated on a case-by-case basis:
  - 1) Stream or drainage channel crossing for pipes 12-inches inside diameter and greater.
  - 2) River or creek crossings requiring special approval from the Division of State Lands.
  - 3) Canal crossings requiring special approval from the North Santiam Water Control District.
- b. The minimum cover from the bottom of the surface water to the top of pipe shall be 36-inches. Concrete encasement along the waterline will be required when the cover from the top of the pipe to the bottom of the surface water is 36-inches or less, unless otherwise approved by the City Engineer. The concrete encasement shall extend to a point where a one-to-one slope begins at the top of the bank and slopes down from the bank away from the surface water centerline and intersects the top of the pipe.

## **405 APPURTENANCES**

### **405.01 VALVES**

- 405.01.A** In general, valves shall be the same size as the pipes in which they are installed. Valve types and materials shall conform to the City of Stayton Construction Standard Specifications. Gate valves will be used for applications 8-inch and smaller and butterfly valves for 10-inch and larger.
- 405.01.B** Gate valves shall be resilient seated conforming to AWWA C-509 and shall be pressure rated for 200 psi. Butterfly valves shall be short-bodied conforming to AWWA C-504 and be pressure rated for 150 psi. All ductile iron mechanical joint fittings shall be pressure rated at 350psi. Flanged fittings and cast iron mechanical joint fittings shall be pressure rated at 250psi and shall be factory cement mortar lined and coated.
- 405.01.C** In general, a tee-intersection shall be valved in two (2) branches and a cross-intersection shall be valved in three (3) branches. Transmission and distribution water mains shall have valves at not more than 500-foot spacing. Hazardous crossings such as creeks and freeway crossings shall be valved on each side. Valves shall be accessible at all times and shall be restrained and located far enough away from the casing such that the pipe in the casing can be removed and replaced between the valves.
- 405.01.D** When a hydrant tee, or a tee branching to a cul-de-sac blow-off is installed in a sloped waterline, install a main line valve on the up hill run of the tee to allow for release of air from hydrant or blow-off. An additional main line valve may be needed on the down hill run of the tee for other operational purposes.
- 405.01.E** Distribution tees and crosses with valves for future branch lines on mains may be required at the direction of the City Engineer. Inline valves for mains may be required as directed by the City Engineer.
- 405.01.F** Water mains installed by phased construction, which will be extended in the future, shall terminate with a blowoff assembly in a location approved by the City Engineer.



## **405.02 FIRE HYDRANTS**

- 405.02.A** Fire hydrants shall be Kennedy K-81D Guardian, Waterous 5 1/4 Pacer, or approved equal. Fire hydrants shall be "high gloss safety yellow" in color and painted or epoxy coated by the manufacturer.
- 405.02.B** No fire hydrant shall be installed on a main of less than 8-inches inside diameter. The fire hydrant lateral shall be a minimum of 6-inches nominal diameter.
- 405.02.C** Fire hydrant installation shall conform to the Standard Drawings. Maximum 6-foot bury fire hydrants will be required in all installations. Installation of fire hydrant extensions will not be allowed, unless specifically approved by the City Engineer.
- 405.02.D** Each fire hydrant shall have an auxiliary valve and valve box that will permit repair of the hydrant without shutting down the main supplying the hydrant. Such auxiliary valves shall be resilient-wedge gate valves. The auxiliary valve shall have mechanical joint-by-flange joint ends and connected directly to the water main using a flange joint tee and "Megalug" retainer glands, or approved equal. Refer to the Standard Drawings.
- 405.02.E** Where necessary or required, bollards (guard posts) shall be constructed at the corners of a 7-foot square with the fire hydrant located in the center for protection from vehicles. Clear access of the fire hydrant ports shall be maintained at all times.

### **405.02.F SPACING**

1. The distribution of fire hydrants shall be based upon the required average fire flow for the area served. Design coverage shall result in hydrant spacing of approximately 500-feet in residential areas and 300-feet in commercial or industrial subdivisions. Where approved, this spacing may be reduced by 100-feet on dead end streets. In all cases, a fire hydrant shall be no further than 250-feet from any building. Additional fire hydrants shall be placed as required by the City Engineer.
2. Where new water mains are extended along streets where fire hydrants are not needed for protection of structures or similar fire problems, fire hydrants shall be provided at a spacing not to exceed 1,000 feet to provide for transportation hazards.
3. The minimum requirements for spacing and minimum number of fire hydrants for all development types shall comply with the Fire Code.

### **405.02.G LOCATION**

1. Fire hydrants shall be placed on the same side of the right-of-way as the waterline serving the fire hydrant. Other proposed locations will require approval by the City Engineer.
2. Fire hydrants shall be located at the back of the existing or proposed sidewalk, in the planter strip, or where approved, behind the sidewalk if adequate right-of-way exists. Residential fire hydrants shall be located as near as possible to the corner of street intersections and shall be located at or near the point of curvature of the curb return or at a common property line.
3. The pumper port of fire hydrant shall be perpendicular to the curb line or shoulder as applicable. If any public fire hydrant encroaches on private property (where approved), an easement must be provided to the City.





4. Fire hydrants shall not be further than 15 feet from an approved access road, shall not be located within 20-feet of any building, and shall not be blocked by parking, unless specifically approved by the Fire Marshall.
5. A fire hydrant shall be located within 70 feet of a fire department connection. The fire department connection and the fire hydrant should be on the same side of a fire access road.
6. Fire hydrants and fire department connections shall not be obstructed and shall not be installed closer than 5-feet from any utility (above or below ground), pole, guy wire, sign, or other obstruction. In addition, a utility (above or below ground), pole, guy wire, sign, or other obstruction shall not be placed less than 5-feet from an existing hydrant. A 5-foot clear space shall be provided at all times.
7. Considerations for placing fire hydrants shall be as follows:
  - a. Where approved, existing fire hydrants in the area may be used to meet the required number of fire hydrants; however, fire hydrants that are over 500 feet away from the nearest point of the subject building shall not contribute to the required number of hydrants.
  - b. Fire hydrants that are separated from the subject building by railroad tracks shall not contribute to the required number of hydrants.
  - c. Fire hydrants that are separated from the subject building by a highway, arterial street, or major collector street shall not contribute to the required number of fire hydrants, unless specifically approved by the Fire Marshall.
  - d. Fire hydrants that are accessible only by a bridge may be allowed to contribute to the required number of hydrants, only if specifically approved by the Fire Marshall.
  - e. Private fire hydrants or public fire hydrants that are on adjacent private property shall not contribute to the required number of hydrants for the subject building.
  - f. When evaluating the placement of fire hydrants at commercial or industrial complexes the first hydrant(s) to be placed shall be at the primary access and any secondary access to the site. After these fire hydrant(s) have been placed other fire hydrants shall be sited to meet the requirements for spacing and minimum number of fire hydrants.

#### **405.03 PRESSURE-REDUCING VALVE ASSEMBLIES**

- 405.03.A** The City's water distribution system is divided into several pressure zones. Where water systems cross these zone lines, a pressure-reducing valve station may be required. The specific design and location for such valves will be reviewed by the City Engineer.

#### **405.04 COMBINATION AIR/VACUUM VALVE ASSEMBLIES**

- 405.04.A** When shown on the plans or designated by the City Engineer, combination air/vacuum valves, per the Standard Drawings shall be installed. Such valves will be required on large diameter transmission and distribution lines at all high points in grade and at other points as determined appropriate by the City Engineer.





## **405.05 RAILROAD OR HIGHWAY CROSSINGS**

- 405.05.A** Railroad or road crossings of a hazardous nature, or as deemed necessary by the City Engineer, shall be valved on both sides of the crossing. Casing under railroad or road crossings, where required, shall be as specified in the permit from the respective agency.

## **406 WATER SERVICE LINES**

### **406.01 GENERAL**

- 406.01.A** The sizes of water service lines that may be used are 1-inch and 2-inch copper, 4-inch, 6-inch, 8-inch, and 12-inch ductile iron. Water service lines will be reviewed for impacts on the distribution system and shall not be greater in size than the distribution main. In no case shall a new service be connected to an existing galvanized waterline, unless specifically approved by the City Engineer.
- 406.01.B** Domestic service lines 1-inch and 2-inches shall normally extend from the main to behind the curb with an angle meter valve and meter box located at the termination of the service connection. See the Standard Drawings.
- 406.01.C** Multiple service connections to a premise shall be laid out to follow a logical sequence of addresses to facilitate matching of service connection to building(s). Onsite waterlines shall be laid out to facilitate a logical matching of service connection to building and address. Each meter must have its own service line and connection to a water main.
- 406.01.D** When a potential corrosive condition is encountered and the copper service passes over or under an active cathodic protection system, the service shall be installed in a Schedule 40 PVC conduit for a distance of 10-feet on each side of the active system. All conduit placements shall be included in the as-built drawings.
- 406.01.E** Unless otherwise approved by the City Engineer, services and lines to be abandoned shall be removed completely back to the line that will remain in service. Existing corporation stops shall be removed and replaced with an approved watertight plug at the water main. The plugs shall not be of dissimilar metals.

### **406.02 METERS**

- 406.02.A** Meters will be provided and installed by the City with costs being the responsibility of the Developer. Meter boxes are to be provided and installed by the Developer. Individual service connections shall terminate in front of the property to be served along the street frontage where property is addressed, and shall be located 18-inches each side of a common side property line. Water service via an easement across a separate tax lot is not allowed unless specifically approved by the City Engineer.
- 406.02.B** For 3/4-inch through 2-inch water meters, the meter shall be located at the termination of the City service line. Except for single-check devices (where approved), meters shall not be located in the same meter box or vault with a backflow prevention device, unless otherwise approved.
- 406.02.C** For 3-inch and larger water meters, the meter shall be installed in vaults and shall be located in the public right-of-way at the entrance to the property being served, unless otherwise approved by the City Engineer, to allow easy reading and maintenance without entering private property. The vault shall be accessible by a crane truck to within 10-feet of the installation with a 10-foot vertical clearance over the vault.



- 406.02.D** Provisions shall be made for a minimum 3-foot clear space around the vault to provide ample working space for maintenance. The vault shall be located such that storm water will not pond or flow into the installation. A design drawing and details must be submitted to the City showing the vault and fitting requirements, the expected flow (normal and maximum daily flow) requirements, and proposed usage.
- 406.02.E** The following table provides general design criteria for water service and meter sizing (*based on Sensus SR-II and OMNI C<sup>2</sup> Meter Specifications*):

<b>GENERAL DESIGN CRITERIA WATER SERVICE AND METER SIZING</b>			
<b>Service Size (Inches)</b>	<b>Meter Size (Inches)</b>	<b>Maximum Meter Design Flow<sup>(1)(2)</sup> (GPM)</b>	<b>Pressure Loss Through Meter (PSI @ GPM)</b>
1	3/4	30	9 @ 30
1	1	50	7.3 @ 50
2	1 1/2	200	6.9 @ 160
2	2	200	4.3 @ 160
4	3	500	3.2 @ 400
4	4	1000	6.4 @ 800
6	6	2000	5.5 @ 1600
8	8 <sup>(3)</sup>	By Design Engineer	By Design Engineer

Notes: 1. Continuous flow not to exceed 30% of maximum design flow for 3/4-inch and 1-inch disc meters.  
2. Continuous flow not to exceed 50% of maximum design flow for all 1 1/2-inch and larger compound meters.  
3. Meters 8-inches and larger will be reviewed on a case-by-case basis.

### **406.03 FIRE SERVICES**

- 406.03.A** There are three (3) categories of private fire services: (1) hydrants (private hydrants, except for large industrial sites are not allowed), (2) fire sprinkler lines, and (3) combination hydrant and fire sprinkler lines.
- 406.03.B** The fire service lines shall extend from the water main to the property line, and end with an approved vault, metering device, and valves. An approved backflow prevention assembly will be required of the property being served. To minimize maintenance problems, the placement of an approved backflow prevention assembly within the building they serve is encouraged. The fire service line serving the building shall be placed in an easement. Additional valving is required to delineate the public and private portions of the fire service lines.
- 406.03.C** The flow meter and sensor (Data Industrial Series 1400 w/220 MB sensor or approved equal) for fire service lines will be installed by the City, unless directed otherwise. All costs will be the responsibility of the Developer.
- 406.03.D** Fire service lines serving only fire sprinkler systems shall be metered by a detector meter on the approved backflow assembly.
- 406.03.E** Fire sprinkler systems for single-family residences shall be served through a standard metered service. The fire sprinkler system may be served through the domestic service for the same residence. The combined domestic, irrigation, and fire sprinkler flow demands may not exceed the allowable flow for that particular size of service and meter.



## **406.04 MANUFACTURED HOME PARKS AND MASTER PLANNED DEVELOPMENTS**

- 406.04.A** The review of plans and the inspection of manufactured home parks and master planned developments are under the jurisdiction of Marion County Building Department. Private distribution systems shall be designed in accordance with the Oregon Plumbing Specialty Code. Public water mains within manufactured home parks and planned unit developments shall be in exclusive easements to the City and built to public standards.

## **407 CROSS CONNECTION AND BACKFLOW PREVENTION**

### **407.01 GENERAL**

- 407.01.A** Cross connection control and backflow assemblies shall conform to the requirements of the Oregon Administrative Rules Chapter 333, the Oregon Plumbing Specialty Code, NFPA, and Marion County Building Department.
- 407.01.B** An approved backflow prevention assembly is required on all fireline systems, domestic water service 1 1/2-inch and larger, irrigation services, fire sprinkler systems, and/or structures or areas having potential health hazards in accordance with OAR 333-061-0070.
- 407.01.C** It is the Design Engineer's responsibility to select the proper backflow prevention assembly and vault and to include the proper engineering drawings and detail sheets with both the site development permit and site plumbing permit application, as applicable for the particular circumstances. The Design Engineer is responsible for coordinating with the City Engineer, Contractor, and Marion County Building Official.
- 407.01.D** If there is a change in the use or proposed use of the building served by the approved backflow prevention device, or other factors that requires an alternative backflow prevention design, it is the Design Engineer's responsibility to select an alternative backflow prevention assembly and vault as required to reflect the change, and to submit new detail drawings for review.
- 407.01.E** City approval of the engineering plans and detail drawings within a plan set for a development is not formal approval of the private backflow prevention assemblies and vaults in said plan set. Further, City approval of plans and detail drawings within a plan set does not relieve the Design Engineer of any of the aforementioned responsibilities.

## **408 REQUIREMENTS FOR WATER SYSTEM VAULTS**

### **408.01 GENERAL**

- 408.01.A** Vaults for water meters, PRVs, fire services, and combination air and vacuum release valves, and vaults' appurtenances including but not limited to ladders, access doors, sump pumps, and drains, shall conform to the Standard Drawings and the requirements shown in Subsection 408.02 below.

### **408.02 VAULT REQUIREMENTS**

- 408.02.A** Vault shall be as manufactured by Utility Vault, or approved equal. Vault shall have no other use, except for use described by these Standards.



- 408.02.B** Access into the vault shall be through a standard Bilco door unless otherwise approved by the City Engineer. All Bilco doors on any public vault in the public right-of-way shall be structurally adequate for an H-20 loading. If any public or private vault is within a parking or maneuvering area (including the travel lane of any public or private street), the Design Engineer shall evaluate the specific loading conditions and specify the proper door for those loading conditions. The Design Engineer's evaluation and recommended lid design shall be submitted to the City Engineer for review.
- 408.02.C** An approved ladder shall be provided if the vault or chamber depth is five (5)-foot or greater and entry is through the vault or chamber roof. Approved ladder extensions shall comply with OSHA requirements as required by City, State, and Federal standards.
- 408.02.D** Adequate drainage that prevents water from accumulating on the vault or chamber floor shall be provided for the vault or chamber. Trapped water in the vault shall be drained to daylight by gravity or an approved duplex sump pump system. In no case shall the drainage be connected to a piped sanitary or storm water system. If a duplex sump pump system is utilized, the pumps shall be capable of removing accumulated water from the vault with a minimum flow rate of five (5) gallons per minute (GPM). The pumps shall be equipped with an automatic flow switch; the pumps and all the wiring shall conform to the National Electrical Code requirements.
- 408.02.E** Vault shall not be installed in areas that are subject to ponding water or flooding. Vault shall be protected from freezing and other severe weather conditions in accordance with NFPA requirements.
- 408.02.F** Vault shall be installed on 4-inch min thick compacted 1-inch minus granular base rock over stable subgrade. Backfill around the vault shall be in accordance with the Standard Construction Specifications, and in accordance with the manufacturer's recommendations. Vault pick holes shall be sealed with non-shrink grout. Vault pipe penetrations shall be installed with link-seal modular seals, or approved equal.
- 408.02.G** Piping shall be adequately supported from the floor and suitably restrained from movement. Supports shall consist of approved steel supports with corrosion protection; no wood supports shall be used. Piping shall be readily accessible with adequate room for maintenance. Access shall remain clear at all times.
- 408.02.H** No piping shall be installed in excess of three (3) feet above the vault floor. Piping shall have a minimum 12-inch clearance on the backside, 24-inch clearance on any test-cock side, and 12 inches below the piping from the vault. Adequate clearance (three (3) inches minimum) must be maintained above gate-valve stem at full extension. Headroom of six (6) feet is required in vaults without a full opening top.
- 408.02.I** Where required, vaults shall be equipped with a moisture proof light fixture. All electrical wiring shall be inspected by Marion County Building Department (permit is required). The Design Engineer shall obtain a copy of final electrical inspection from the Contractor and submit it to the City.
- 408.02.J** All new services shall be pressure tested and disinfected by the Contractor and proven to be bacteriologically safe from the existing main to the vault.



## **409 DISINFECTION, PRESSURE AND LEAKAGE TESTING**

### **409.01 GENERAL**

- 409.01.A** New water systems (lines, valves, hydrants, services, etc.) shall be pressure tested, chlorinated, and tested for bacteria in accordance with the Standard Construction Specifications, and in the presence of a City Engineer.
- 409.01.B** No connection to existing water services shall be made until the new system has been tested and accepted.

## **410 WATER QUALITY SAMPLING STATIONS**

### **410.01 GENERAL**

- 410.01.A** If a water sampling station is required by the City for a particular development (typically 1 station to 20 lots in new subdivisions), the sampling station shall be provided and installed by the Developer. Details pertaining to the water quality sampling station shall be coordinated with the City Engineer. See Standard Drawings.

**\* END OF DIVISION\***